Operating Instructions

VEGABAR 52

4 … 20 mA/HART

p

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Supplementary operating instructions manuals

Information:
VEGABAR 52 is available in different versions and is supplied order-specifically. Depending on the selected version, supplementary operating instructions manuals come with the shipment. The supplementary operating instructions are stated in paragraph *"Product description"*.

Operating instructions manuals for accessories and replacement parts

Tip:
VEGA offers accessories and replacement parts for reliable use and operation of your VEGABAR 52. The corresponding operating instructions manuals are:

- Operating instructions manual "*External indicating and adjustment unit VEGADIS 61*"
- Operating instructions manual "*Oscillator VEGABAR series 50 and 60*"

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1 About this document

1.1 Function

This operating instructions manual has all the information you need for quick setup and safe operation of VEGABAR 52. Please read this manual before you start setup.

1.2 Target group

This operating instructions manual is directed to trained personnel. The contents of this manual should be made available to these personnel and put into practice by them.

1.3 Symbolism used

Information, tip, note
This symbol indicates helpful additional information.

Caution, warning, danger
This symbol informs you of a dangerous situation that could occur. Ignoring this cautionary note can impair the person and/or the instrument.

Ex applications
This symbol indicates special instructions for Ex applications.

- **List**
  The dot set in front indicates a list with no implied sequence.

→ **Action**
This arrow indicates a single action.

1 **Sequence**
Numbers set in front indicate successive steps in a procedure.

2 For your safety

2.1 Authorised personnel

All operations described in this operating instructions manual must be carried out only by trained, specialised personnel authorised by the operator. For safety and warranty reasons, any internal work on the instruments must be carried out only by personnel authorised by the manufacturer.

2.2 Appropriate use

VEGABAR 52 is a pressure transmitter for measurement of gauge pressure, absolute pressure and vacuum.

2.3 Warning about misuse

Inappropriate or incorrect use of the instrument can give rise to application-specific hazards, e.g. vessel overfill or damage to system components through incorrect mounting or adjustment.

2.4 General safety instructions

VEGABAR 52 is a high-tech instrument requiring the strict observance of standard regulations and guidelines. The user must take note of the safety instructions in this operating instructions manual, the country-specific installation standards (e.g. the VDE regulations in Germany) as well as all prevailing safety regulations and accident prevention rules.

2.5 CE conformity

VEGABAR 52 is in CE conformity with EMC (89/336/EWG), fulfils the NAMUR recommendation NE 21 and is in CE conformity with LVD (73/23/EWG).

Conformity has been judged acc. to the following standards:

- EMC:
  - Emission EN 61326: 2004 (class B)
  - Susceptibility EN 61326: 2004 incl. supplement A
- NSR: EN 61010-1: 2001

In addition, VEGABAR 52 is subject to the pressure device guideline (97/23/EG) without CE marking.

The max. pressure is 200 bar.

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2.6 Compatibility acc. to NAMUR NE 53

VEGABAR 52 meets NAMUR recommendation NE 53. VEGA instruments are generally upward and downward compatible:

- sensor software for DTM-VEGABAR 52 HART, PA or FF
- DTM VEGABAR 52 for adjustment software PACTware™
- adjustment module PLICSCOM for sensor software

The parameter adjustment of the basic sensor functions is independent of the software version. The range of available functions depends on the respective software version of the individual components.

The software version of VEGABAR 52 can be determined as follows:

- via PACTware™
- on the type label of the electronics
- via the adjustment module PLICSCOM

On our website www.vega.com you will find all software histories. Make use of this convenience and get registered for update information via e-mail.

2.7 Safety information for Ex areas

Please note the Ex-specific safety information for installation and operation in Ex areas. These safety instructions are part of the operating instructions manual and come with the Ex-approved instruments.

2.8 Environmental instructions

Protection of the environment is one of our most important duties. That is why we have introduced an environment management system with the goal of continuously improving company environmental protection. The environment management system is certified acc. to DIN EN ISO 14001.

Please help us fulfil this obligation by observing the environmental instructions in this manual:

- Chapter "*Storage and transport*"
- Chapter "*Disposal*"

3 Product description

3.1 Configuration

Scope of delivery

The scope of delivery encompasses:

- VEGABAR 52 process pressure transmitter
- Documentation
  - this operating instructions manual
  - test certificate
  - Ex-specific safety instructions (with Ex versions) and, if necessary, further certificates
  - Operating instructions manual "*Indicating and adjustment module PLICSCOM*" - optional
  - Supplementary instructions manual *"Plug connector for continuously measuring sensors"* - optional

Components

VEGABAR 52 consists of the following components:

- Process fitting with measuring cell
- Housing with electronics, optionally available with plug connector
- Housing cover, optionally available with indicating and adjustment module PLICSCOM

The components are available in different versions.

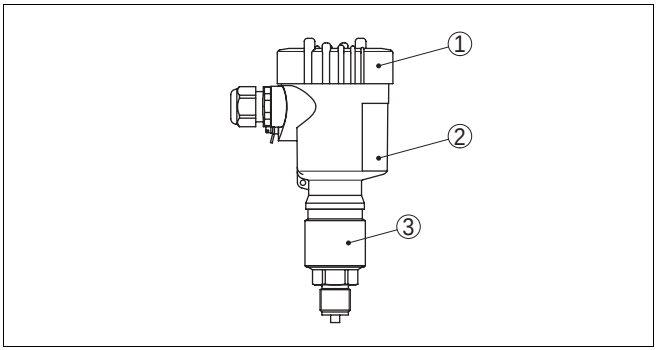

Fig. 1: Example of a VEGABAR 52 with manometer connection G½A acc. to EN 837 and plastic housing
1 Housing cover with integrated PLICSCOM (optional)
2 Housing with electronics
3 Process fitting with measuring cell

3.2 Principle of operation

Area of application

VEGABAR 52 is a pressure transmitter for measurement of gauge pressure, absolute pressure or vacuum. Measured products are gases, vapours and liquids.

Physical principle

Sensor element is the CERTEC® measuring cell with rugged ceramic diaphragm. The process pressure causes a capacitance change in the measuring cell via the ceramic diaphragm. This change is converted into an appropriate output signal and outputted as measured value.

The CERTEC® measuring cell is also equipped with a temperature sensor. The temperature value can be displayed via PLICSCOM or processed via the signal output.

Power supply

Two-wire electronics 4 … 20 mA/HART for power supply and measured value transmission on the same cable.

The power supply range can differ depending on the instrument version. The exact range is stated in the "*Technical data*" in the "*Supplement*".

3.3 Adjustment

VEGABAR 52 can be adjusted with four different adjustment media:

- the indicating and adjustment module PLICSCOM
- with the suitable VEGA DTM in conjunction with an adjustment software acc. to FDT/DTM standard, e.g. PACTware™ and PC
- with manufacturer-specific adjustment programs AMS™ or PDM
- a HART handheld

The entered parameters are generally saved in VEGABAR 52, optionally also in PLICSCOM or in PACTware™.

3.4 Storage and transport

Packaging

Your instrument was protected by packaging during transport. Its capacity to handle normal loads during transport is assured by a test acc. to DIN EN 24180.

The packaging of standard instruments consists of environment-friendly, recyclable cardboard. For special versions, PE foam or PE foil is also used. Dispose of the packaging material via specialised recycling companies.

Storage and transport temperature

- Storage and transport temperature see "*Supplement – Technical data – Ambient conditions*"
- Relative humidity 20 … 85 %

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4 Mounting

4.1 General instructions

Wetted materials

Check if the wetted materials such as seal, process fitting etc. are suitable for the existing process conditions, such as product, temperature etc.

Installation location

Select an installation position you can easily reach for mounting and connecting as well as later retrofitting of an indicating and adjustment module. The housing can be rotated by 330° without the use of any tools. You can also install the indicating and adjustment module in four different positions (each displaced by 90°).

Moisture

Use the recommended cable (see chapter "*Connecting to power supply*") and tighten the cable gland.

You can give your VEGABAR 52 additional protection against moisture penetration by leading the connection cable downward in front of the cable entry. Rain and condensation water can thus drain off. This applies mainly to mounting outdoors, in areas where moisture is expected (e.g. by cleaning processes) or on cooled or heated vessels.

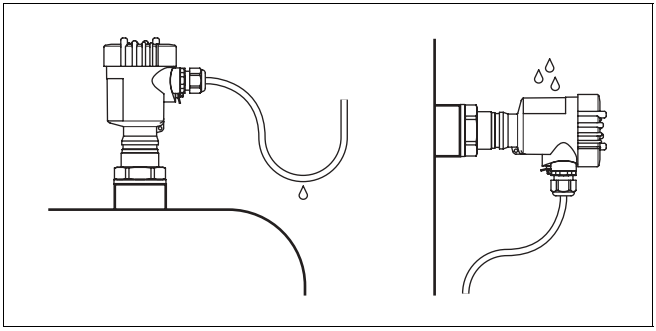

Fig. 2: Measures against moisture penetration

4.2 Mounting information

Installation location

VEGABAR 52 functions in any installation position[1]. It is mounted acc. to the same regulations like a manometer (DIN EN 839-2).

[1] If necessary, position correction see "Setup procedure".

Information:
We recommend using lock fittings, measuring instrument holders and siphons from the line of VEGA accessories.

4.3 Mounting procedure

Welding the socket

To mount VEGABAR 52, a welded socket is necessary. Use components from the line of VEGA mounting accessories:

- Welded socket G½A, article no. 2.7783
- Manometer welding tube G½A, article no. 2.24462 or 2.19990.

→ Note the applicable welding standards (segment welding procedure) when welding the socket.

Sealing/Screwing in

Use the appropriate seal:

- Process fitting GV, GB, GC, GI: Tesnit 6.2x17.5x1, article no. 2.14815, seal in front of the thread
- Process fitting GP, GL, GS: Klingersil 21x30x2, article no. 2.5056, seal behind the thread

– or –

Seal the thread with teflon, hemp or a similar resistant seal material:

- Process fitting GN

→ Screw VEGABAR 52 into the welded socket. Tighten the hexagon screw on the process fitting. Wrench size see dimensional drawings.

Warning:
The housing must not be used to screw the instrument in! Applying tightening force to the housing can damage its internal mechanical components.

5 Connecting to power supply

5.1 Preparing the connection

Note safety instructions

Always observe the following safety instructions:

- Connect only in the complete absence of line voltage
- If overvoltages are expected, overvoltage arresters should be installed.

Tip:
We recommend VEGA overvoltage arresters ÜS-F-LB-I and ÜSB 62-36G.X.

Take note of safety instructions for Ex applications

In hazardous areas you should take note of the appropriate regulations, conformity and type approval certificates of the sensors and power supply units.

Select power supply

Power supply and current signal are transmitted via the same two-wire connection cable. The power supply range can differ depending on the instrument version. The exact range is stated in the "*Technical data*" in the "*Supplement*".

Provide a reliable separation between the supply circuit and the mains circuits acc. to DIN VDE 0106 part 101. The VEGA power supply units VEGATRENN 149AEx, VEGASTAB 690, VEGADIS 371 as well as all VEGAMETs meet this requirement.

Bear in mind the following factors regarding supply voltage:

- the reduction of the output voltage of the power supply unit under nominal load (with a sensor current of 20.5 mA or 22 mA in case of fault signal)
- the influence of additional instruments in the circuit (see load values in "*Technical data*").

Selecting the connection cable

VEGABAR 52 is connected with standard two-wire cable without screen. An outer cable diameter of 5 … 9 mm ensures the seal effect of the cable entry. If strong electromagnetic interference is expected, we recommend the use of screened cable.

Cable gland ½ NPT

On VEGABAR 52 with cable gland ½ NPT and plastic housing, a metal ½" threaded insert is moulded in the plastic housing.

Caution:
No grease should be used when screwing the NPT cable gland or steel tube into the threaded insert. Standard grease can contain additives affecting the connection between threaded insert and housing. This will influence the stability of the connection and the tightness of the housing.

Cable screening and grounding

If screened cable is necessary, connect the cable screen on both ends to ground potential. In the sensor, the screen must be connected directly to the internal ground terminal. The ground terminal outside on the housing must be connected to the potential equalisation (low impedance).

If potential equalisation currents are expected, the connection on the evaluation side must be made via a ceramic capacitor (e.g. 1 nF, 1500 V). The low frequency potential equalisation currents are thus suppressed, but the protective effect against high frequency interference signals remains.

Select connection cable for Ex applications

Take note of the corresponding installation regulations for Ex applications. In particular, make sure that no potential equalisation currents flow over the cable screen. In case of grounding on both sides this can be achieved by the use of a capacitor or a separate potential equalisation.

5.2 Connection procedure

Proceed as follows:

1 Unscrew the housing cover

2 If an indicating and adjustment module is installed, remove it by turning it slightly to the left.

3 Loosen compression nut of the cable entry

4 Remove approx. 10 cm (4 in) of the cable mantle, strip approx. 1 cm (0.4 in) insulation from the ends of the individual wires

5 Insert the cable into the sensor through the cable entry

6 Lift the opening levers of the terminals with a screwdriver (see following illustration)

7 Insert the wire ends into the open terminals according to the wiring plan

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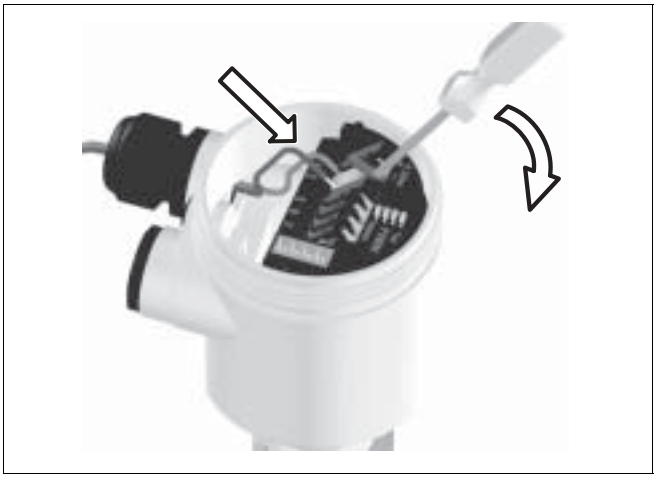


Fig. 3: Connection steps 6 and 7

8 Press down the opening levers of the terminals, you will hear the terminal spring closing

9 Check the hold of the wires in the terminals by lightly pulling on them

10 Connect the screen to the internal ground terminal and the external ground terminal to potential equalisation

11 Tighten the compression nut of the cable entry, the seal ring must completely encircle the cable

12 Screw the housing cover back on

The electrical connection is finished.

5.3 Wiring plans, single chamber housing

The following illustrations apply to the non-Ex as well as to the Ex ia version.

Housing overview

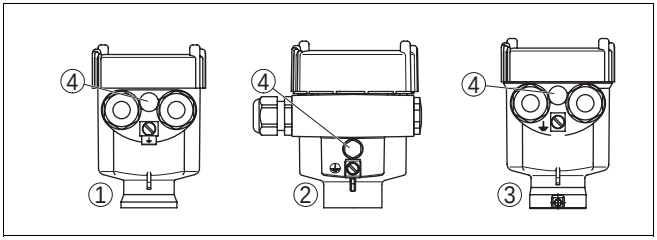


Fig. 4: Material versions, single chamber housing
1 Plastic
2 Aluminium
3 Stainless steel
4 Filter element for pressure compensation or blind stopper with version IP 66/ IP 68, 1 bar

Electronics and connection compartment

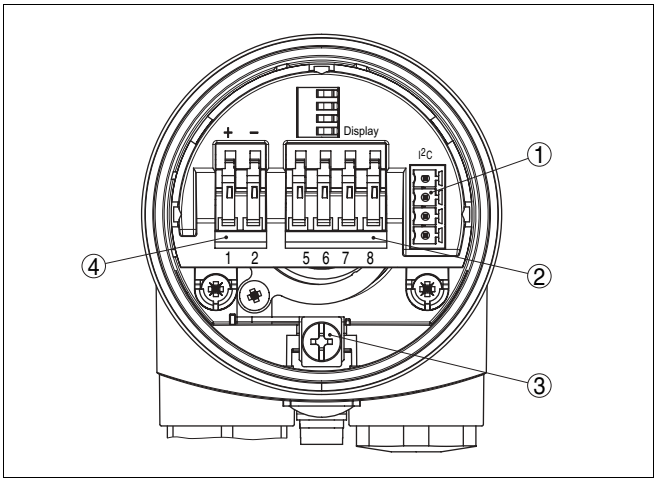


Fig. 5: Electronics and connection compartment, single chamber housing
1 Plug connector for VEGACONNECT (I^2C interface)
2 Spring-loaded terminals for connection of the external indication VEGADIS 61
3 Ground terminal for connection of the cable screen
4 Spring-loaded terminals for power supply

Wiring plan

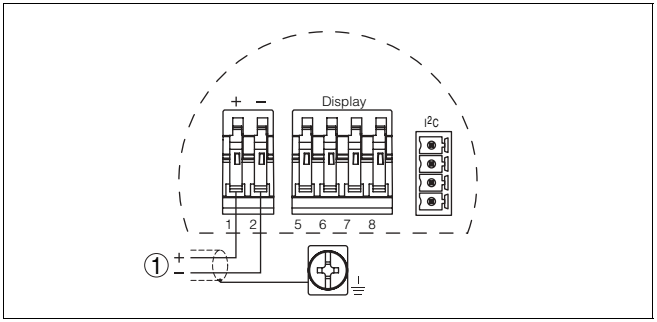


Fig. 6: Wiring plan, single chamber housing
1 Power supply/Signal output

5.4 Wiring plans, double chamber housing

The following illustrations apply to the non-Ex as well as to the Ex ia version. The Exd version is described in the next subchapter.

Housing overview

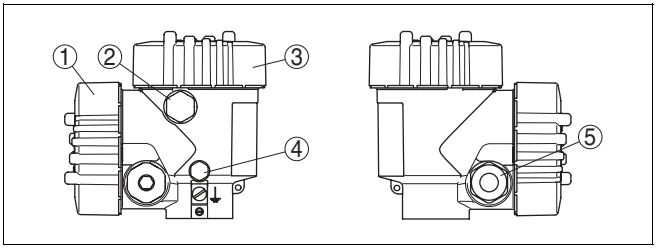


Fig. 7: Double chamber housing
1 Housing cover, connection compartment
2 Blind stopper or plug M12x1 for VEGADIS 61 (option)
3 Housing cover, electronics compartment
4 Filter element for pressure compensation or blind stopper with version IP 66/ IP 68, 1 bar[2)]
5 Cable entry or plug

[2)] Version IP 66/IP 68, 1 bar not with four-wire instruments

Electronics compartment

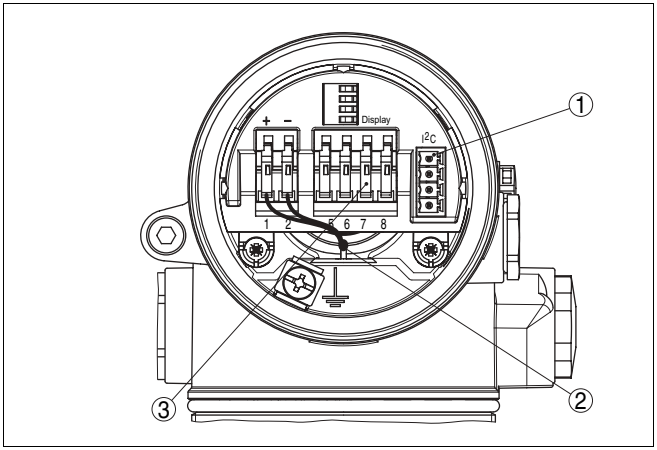


Fig. 8: Electronics compartment, double chamber housing
1 Plug connector for VEGACONNECT (I^2C interface)
2 Internal connection cable to the connection compartment
3 Terminals for VEGADIS 61

Connection compartment

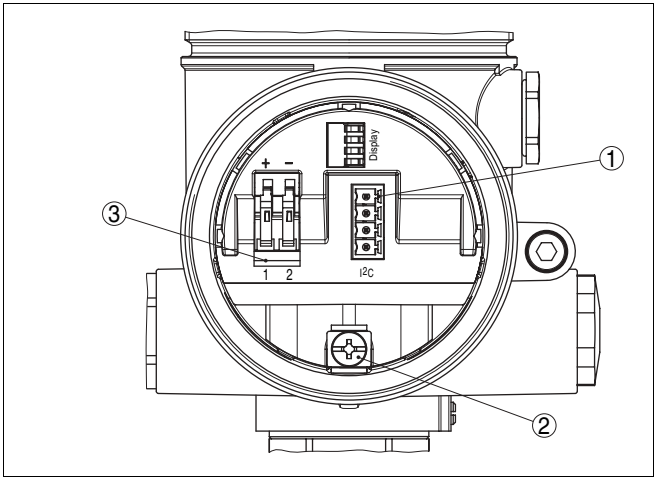


Fig. 9: Connection compartment, double chamber housing
1 Plug connector for VEGACONNECT (I^2C interface)
2 Ground terminal for connection of the cable screen
3 Spring-loaded terminals for power supply

Wiring plan

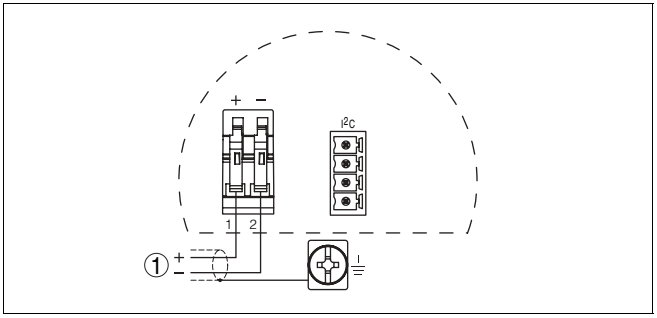


Fig. 10: Wiring plan, double chamber housing
1 Power supply/Signal output

5.5 Wiring plans, double chamber housing Exd

Housing overview

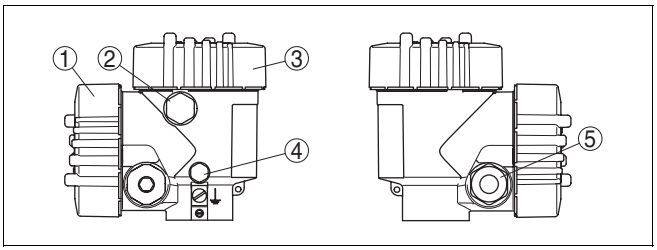


Fig. 11: Double chamber housing
1 Housing cover, connection compartment
2 Blind stopper or plug M12x1 for VEGADIS 61 (option)
3 Housing cover, electronics compartment
4 Filter element for pressure compensation or blind stopper with version IP 66/ IP 68, 1 bar[3)]
5 Cable entry or plug

3) Version IP 66/IP 68, 1 bar not with four-wire instruments

Electronics compartment

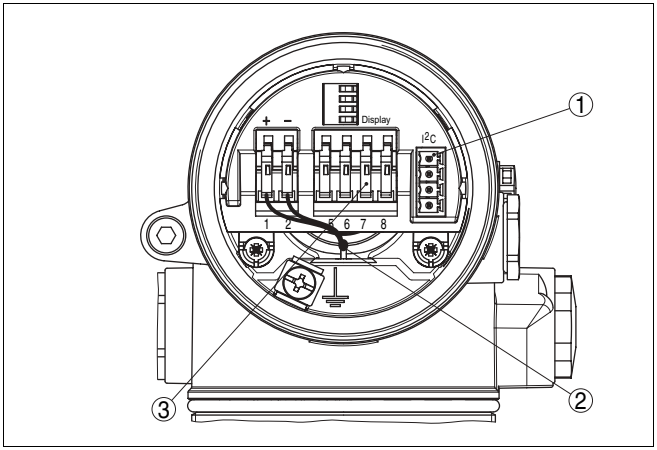


Fig. 12: Electronics compartment, double chamber housing
1 Plug connector for VEGACONNECT (I^2C interface)
2 Internal connection cable to the connection compartment
3 Terminals for VEGADIS 61

Connection compartment

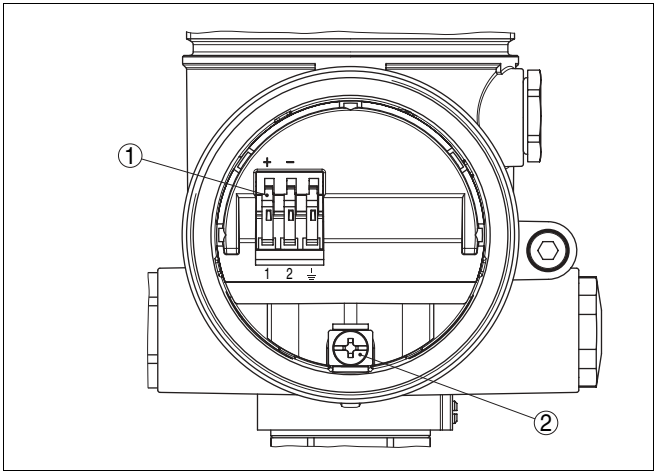


Fig. 13: Connection compartment, double chamber housing Exd
1 Spring-loaded terminals for power supply and cable screen
2 Ground terminal for connection of the cable screen

Wiring plan

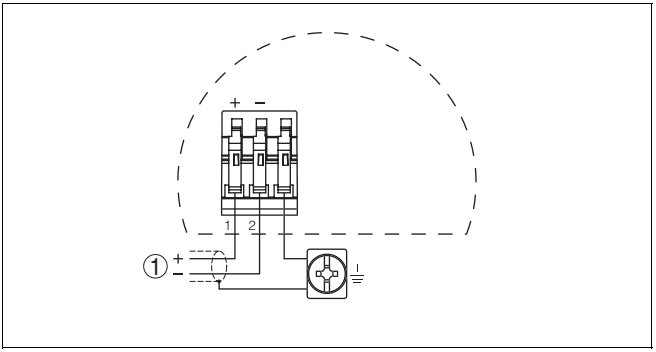


Fig. 14: Wiring plan, double chamber housing Exd
1 Power supply/Signal output

5.6 Wiring plans, version IP 66/IP 68 (1 bar)

This version is only available for instruments with absolute pressure measuring ranges.

Wire assignment, connection cable

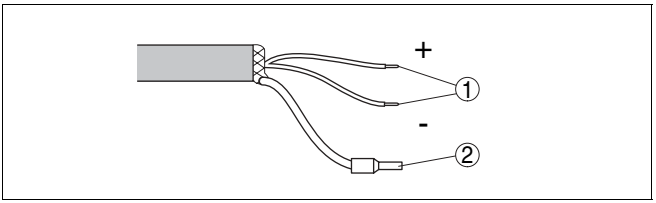


Fig. 15: Wire assignment, connection cable
1 br (+) and bl (–) for power supply or to the processing system
2 Screen

5.7 Switch on phase

Switch on phase

After VEGABAR 52 is connected to power supply, the instrument carries out a self-test for approx. 30 seconds. The following steps are carried out:

- Internal check of the electronics
- Indication of the instrument type, the firmware version as well as the sensor TAGs (sensor name)
- Output signal jumps briefly (approx. 10 seconds) to the set fault current

Then the actual measured value is displayed and the corresponding current is transmitted to the cable.[4)]

[4)] The values correspond to the actual level as well as to the settings already carried out, e.g. default setting.

6 Setup with the indicating and adjustment module PLICSCOM

6.1 Short description

Function/Configuration

The indicating and adjustment module PLICSCOM is used for measured value display, adjustment and diagnosis. It can be mounted in the following housing versions and instruments:

- All sensors of the plics® instrument family, in the single as well as in the double chamber housing (optionally in the electronics or connection compartment)
- External indicating and adjustment unit VEGADIS 61.

Note:
You will find detailed information on the adjustment in the operating instructions manual of the indicating and adjustment module PLICSCOM.

6.2 Installing the indicating and adjustment module PLICSCOM

Insert/remove PLICSCOM

PLICSCOM can be inserted or removed at any time. It is not necessary to interrupt the power supply.

To mount, proceed as follows:

1 Unscrew the housing cover

2 Place PLICSCOM in the desired position on the electronics (you can choose any one of four different positions - each displaced by 90°)

3 Press PLICSCOM lightly onto the electronics and turn it to the right until it snaps in.

4 Screw housing cover with inspection window tightly back on

Removal is carried out in reverse order.

PLICSCOM is powered by the sensor, an additional connection is not necessary.

Fig. 16: Installation of PLICSCOM

Note:
If you intend to retrofit VEGABAR 52 with a PLICSCOM for continuous measured value indication, a higher cover with an inspection glass is required.

6.3 Adjustment system

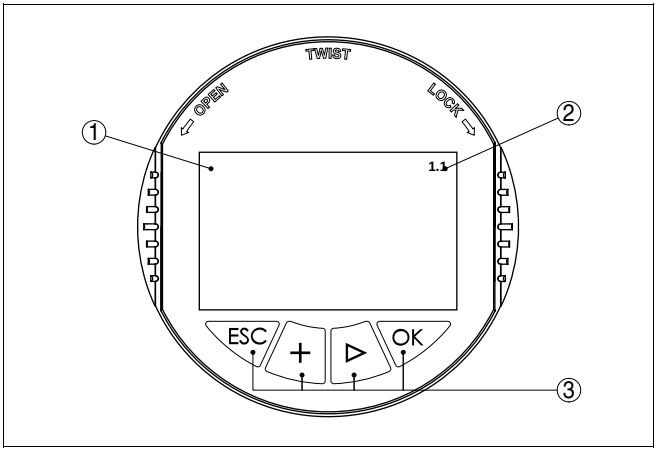


Fig. 17: Indicating and adjustment elements
1 LC display
2 Indication of the menu item number
3 Adjustment keys

Key functions

- ***[OK]*** key:
  - move to the menu overview
  - confirm selected menu
  - edit parameter
  - save value
- ***[–>]*** key to select:
  - menu change
  - list entry
  - editing position
- ***[+]*** key:
  - modify value of a parameter
- ***[ESC]*** key:
  - interrupt input
  - jump to the next higher menu

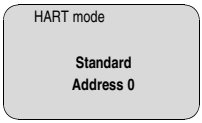
Adjustment system

The sensor is adjusted via the four keys of the indicating and adjustment module. The LC display indicates the individual menu items. The functions of the individual keys are shown in the above illustration. Approx. 10 minutes after the last pressing of a key, an automatic reset to measured value indication is triggered. Any values not confirmed with ***[OK]*** will not be saved.

6.4 Setup procedure

Address setting HART-Multidrop

In HART-Multidrop mode (several sensors on one input) the address must be set before continuing with the parameter adjustment. You will find a detailed description in the operating instructions manual of PLICSCOM or in the online help of PACTware™ or DTM.



Process pressure or level measurement

VEGABAR 52 can be used for process pressure as well as for level measurement. Default setting is process pressure measurement. The mode can be changed in the adjustment menu.

Depending on your application, only the respective subchapter "Process pressure measurement" or "Level measurement" will apply. There you will find the individual adjustment steps.

Optional settings

Additional adjustment and diagnosis options such as e.g. scaling, simulation or trend curve presentation are shown in the following menu schematic. You will find a detailed description of these menu items in the operating instructions manual of the indicating and adjustment module PLICSCOM.

Process pressure measurement

Parameter adjustment "Process pressure measurement"

Set up VEGABAR 52 in the following sequence:

1 Select the adjustment unit

2 Carry out position correction

3 Carry out zero adjustment

4 Carry out span adjustment

In the menu item "*Units of measurement*" you select the physical unit in which the adjustment should be carried out, e. g. mbar, bar, psi...

The position correction compensates the influence of the mounting position or static pressure on the measurement. It does not influence the adjustment values.

In the menu items "*zero*" and "*span*" you determine the span of the sensor, the span corresponds to the end value.

Information:
These steps are not necessary for instruments which are already preset acc. to customer specifications!

You can find these data on the type label on the instrument and in the menu items of the zero/span adjustment.

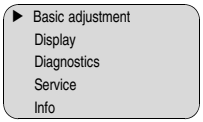
PLICSCOM enables the adjustment without filling or pressure. You can carry out the settings in the workshop without the instrument having to be installed.

In addition to the menu items for zero/span adjustment, the current measured value is displayed.

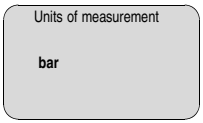
Select the adjustment unit

To switch over to another adjustment unit (in the example from bar to mbar), proceed as follows:[5)]

1 Push the ***[OK]*** button in the measured value display, the menu overview is displayed.



2 Confirm the menu "***Basic adjustment***" with *[OK]*, the menu item "*Units of measurement*" will be displayed.



3 Activate the selection with ***[OK]*** and select the requested unit with ***[–>]*** (in the example mbar).

4 Confirm with ***[OK]*** and move to position correction with ***[–>]***.

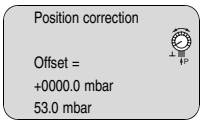
The adjustment unit is now changed from bar to mbar.

Carry out position correction

Proceed as follows:

1 Edit the offset value in the menu item "*Position correction*" with ***[OK]***.

[5)] Selection options: mbar, bar, psi, Pa, kPa, MPa, inHg, mmHg, inH_2O, mmH_2O.



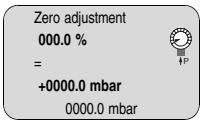
2 Set the requested offset value, e.g. the actual measured value with reciprocal sign with ***[–>]*** and ***[+]***.

3 Confirm with ***[OK]*** and move to min. (zero) adjustment with ***[–>]***.

Carry out zero adjustment

Proceed as follows:

1 Edit the mbar value in the menu item "*zero*" with ***[OK]***.



2 Set the requested mbar value with ***[+]*** and ***[–>]***.

3 Confirm with ***[OK]*** and move to span adjustment with ***[–>]***.

The zero adjustment is finished.

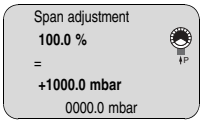
Information:
The zero adjustment shifts the value of the span adjustment. The span, i.e. the difference between these values, however, remains unchanged.

Information:
To adjust with pressure, you simply enter the indicated actual measured value. If the adjustment ranges are exceeded, the message is displayed "Outside parameter limits". The editing procedure can be interrupted with ***[ESC]*** or the displayed limit value can be accepted with ***[OK]***.

Carry out span adjustment

Proceed as follows:

1 Edit the mbar value in the menu item "*span*" with ***[OK]***.



Information:
The displayed pressure for 100 % corresponds e.g. to the nominal range of the sensor (in the above example 1.0 bar = 1000 mbar).

2 Set the requested mbar value with ***[–>]*** and ***[OK]***.

3 Confirm with ***[OK]*** and move to the menu overview with ***[ESC]***.

The span adjustment is finished.

Information:
To adjust with pressure, you simply enter the indicated actual measured value. If the adjustment ranges are exceeded, the message is displayed "Outside parameter limits". The editing procedure can be interrupted with ***[ESC]*** or the displayed limit value can be accepted with ***[OK]***.

The setup of VEGABAR 52 for process pressure measurement is finished. All other menu items are described in the separate operating instructions manual of the indicating and adjustment module PLICSCOM.

Level measurement

Parameter adjustment "Level measurement"

Set up VEGABAR 52 in the following sequence:

1 Select application "Level measurement"

2 Select adjustment unit/density unit

3 Carry out position correction

4 Carrying out min. adjustment

5 Carrying out max. adjustment

In the menu item "*Application*" you switch over from "Process pressure" to "Level measurement".

In the menu item "*Units of measurement*" you select the physical unit in which the adjustment should be carried out, e. g. mbar, bar, psi...

The position correction compensates the influence of the mounting position or static pressure on the measurement. It does not influence the adjustment values.

Information:
These steps are not necessary for instruments which are already preset acc. to customer specifications!

You can find these data on the type label on the instrument and in the menu items of the min./max. adjustment.

PLICSCOM enables the adjustment without filling or pressure. You can carry out the settings in the workshop without the instrument having to be installed.

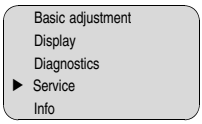
Also the current measured value is shown in the menu items for the min./max. adjustment.

Select application "Level measurement"

VEGABAR 52 is preset to application "Process pressure measurement". Proceed as follows when switching over to application "Level measurement":

1 Push the ***[OK]*** button in the measured value display, the menu overview is displayed.

2 Select the menu ***Service*** with "*[–>]*" and confirm with ***[OK]***.



3 Select the menu item "***Application***" with *[–>]* and edit with ***[OK]***.

Warning:
Note the warning: "Output can change".

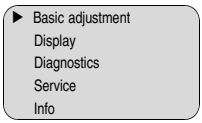
4 Select "OK" with ***[–>]*** "OK" and confirm with ***[OK]***.

5 Select "Level" from the list and confirm with ***[OK]***.

Select adjustment unit/density unit

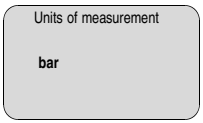
To switch over to another adjustment unit (in the example from bar to mbar), proceed as follows:[6)]

1 Push the ***[OK]*** button in the measured value display, the menu overview is displayed.



2 Confirm the menu "***Basic adjustment***" with *[OK]*, the menu item "*Units of measurement*" will be displayed.

6) Selection options: mbar, bar, psi, Pa, kPa, MPa, inHg, mmHg, inH_2O, mmH_2O, mm, cm, m, in, ft.



3 Activate the selection with ***[OK]*** and select the requested unit with ***[–>]*** (in the example mbar).

4 Confirm with ***[OK]*** and move to position correction with ***[–>]***.

The adjustment unit is now changed from bar to mbar.

Information:
When changing over to a height unit (in the example from bar to m), also the density has to be entered.

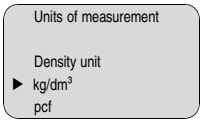
Proceed as follows:

1 Push the ***[OK]*** button in the measured value display, the menu overview is displayed.

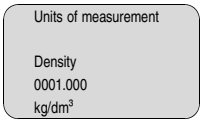
2 Confirm the menu "***Basic adjustment***" with *[OK]*, the menu item "*Units of measurement*" will be displayed.

3 Activate the selection with ***[OK]*** and select the requested unit with ***[–>]*** (in the example m).

4 Confirm with ***[OK]***, the submenu "*Density unit*" appears.



5 Select the requested unit, e.g. kg/dm³ with ***[–>]*** and confirm with ***[OK]***, the submenu "*Density*" appears.



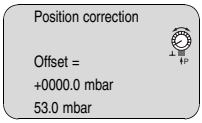
6 Enter the requested density value with ***[–>]*** and ***[+]***, confirm with ***[OK]*** and move to position correction with ***[–>]***.

The adjustment unit is now changed from bar to m.

Carry out position correction

Proceed as follows:

1 Edit the offset value in the menu item "*Position correction*" with ***[OK]***.



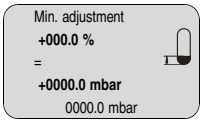
2 Set the requested offset value, e.g. the actual measured value with reciprocal sign with ***[–>]*** and ***[+]***.

3 Confirm with ***[OK]*** and move to min. (zero) adjustment with ***[–>]***.

Carrying out min. adjustment

Proceed as follows:

1 Edit in the menu item "*Min. adjustment*" the % value with ***[OK]***.



2 Set the requested % value with ***[+]*** and ***[–>]***.

3 Edit the requested mbar value with ***[OK]***.

4 Set the requested mbar value with ***[+]*** and ***[–>]***.

5 Confirm with ***[+]*** and move to max. adjustment with ***[–>]***.

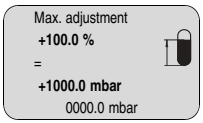
The min. adjustment is finished.

Information:
To adjust with a filling, you simply enter the indicated actual measured value. If the adjustment ranges are exceeded, the message is displayed "Outside parameter limits". The editing procedure can be interrupted with ***[ESC]*** or the displayed limit value can be accepted with ***[OK]***.

Carrying out max. adjustment

Proceed as follows:

1 Edit the % value in the menu item "*Max. adjustment*" with ***[OK]***.



Information:
The displayed pressure for 100 % corresponds to the nominal measuring range of the sensor (in the above example 1.0 bar = 1000 mbar).

2 Set the requested % value with ***[–>]*** and ***[OK]***.

3 Edit the requested mbar value with ***[OK]***.

4 Set the requested mbar value with ***[+]*** and ***[–>]***.

5 Confirm with ***[OK]*** and move to the menu overview with ***[ESC]***.

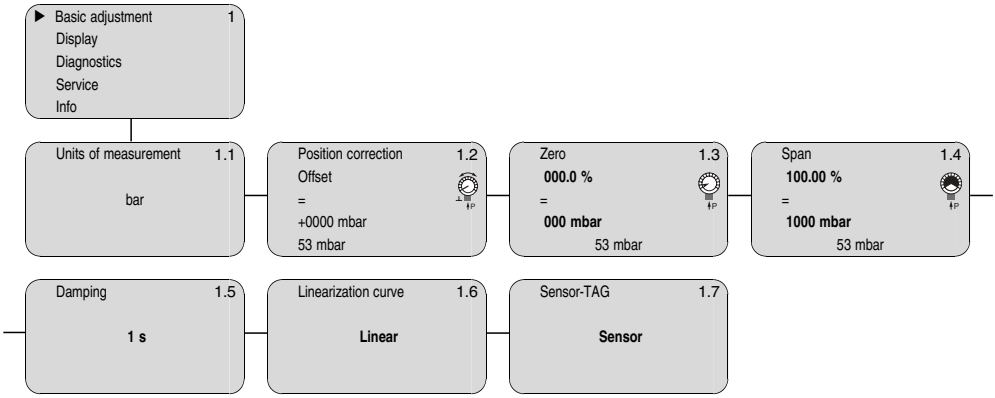
The max. adjustment is finished.

Information:
To adjust with a filling, you simply enter the indicated actual measured value. If the adjustment ranges are exceeded, the message is displayed "Outside parameter limits". The editing procedure can be interrupted with ***[ESC]*** or the displayed limit value can be accepted with ***[OK]***.

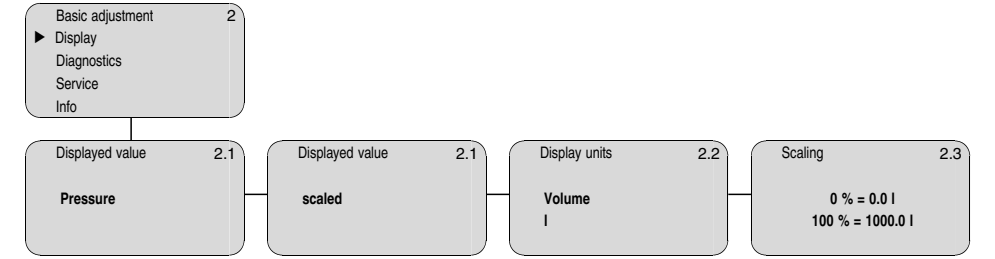
The setup of VEGABAR 52 is finished. All other menu items are described in the separate operating instructions manual of the indicating and adjustment module PLICSCOM.

6.5 Menu schematic

Basic adjustment

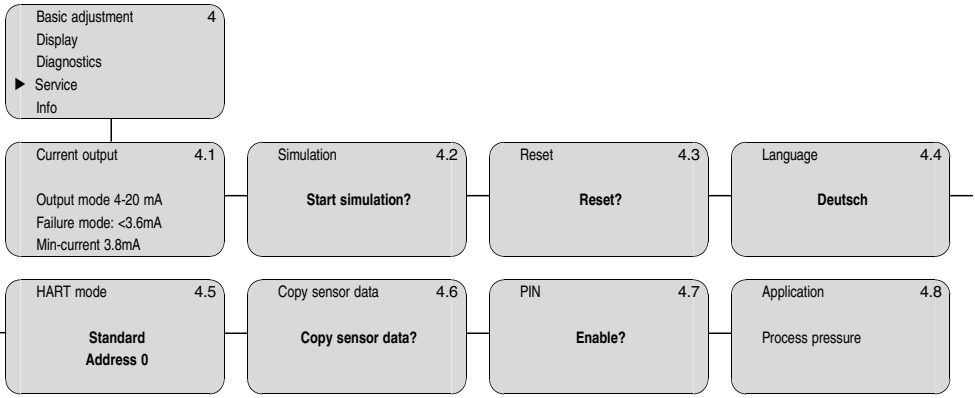


Display

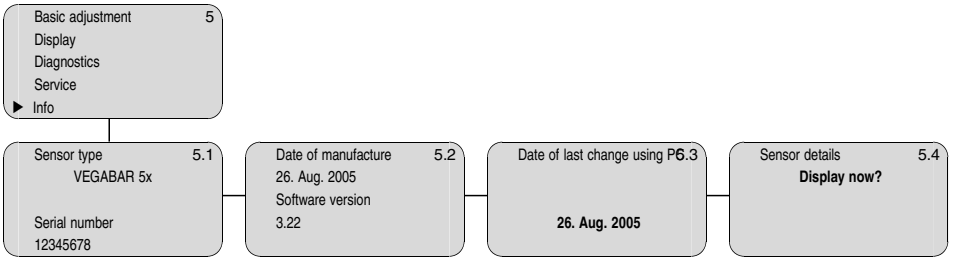


Diagnostics

Service



Info



6.6 Saving the parameter adjustment data

It is recommended noting the adjusted data, e.g. in this operating instructions manual and archive them afterwards. They are hence available for multiple use or service purposes.

If VEGABAR 52 is equipped with an indicating and adjustment module PLICSCOM, the most important data can be read out of the sensor into PLICSCOM. The procedure is described in the operating instructions manual *"Indicating and adjustment module PLICSCOM"* in the menu item *"Copy sensor data"*. The data remain there even if the sensor power supply fails.

If it is necessary to exchange VEGABAR 52, PLICSCOM is inserted into the replacement instrument and the data are also written into the sensor under the menu item *"Copy sensor data"*.

7 Setup with PACTware™ and other adjustment programs

7.1 Connecting the PC

Connecting the PC directly to the sensor

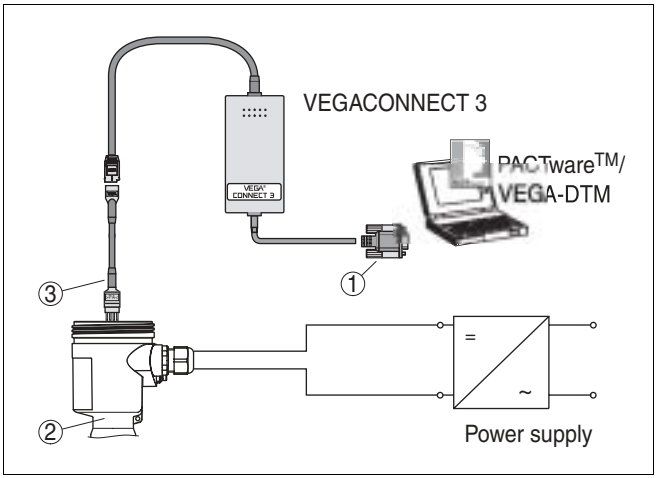


Fig. 18: PC connected directly to the sensor
1 RS232 connection
2 VEGABAR 52
3 I²C adapter cable for VEGACONNECT 3

Necessary components:

- VEGABAR 52
- PC with PACTware™ and suitable VEGA-DTM
- VEGACONNECT 3 with I²C adapter cable (article no. 2.27323)
- Power supply unit

Connecting the PC to the signal cable

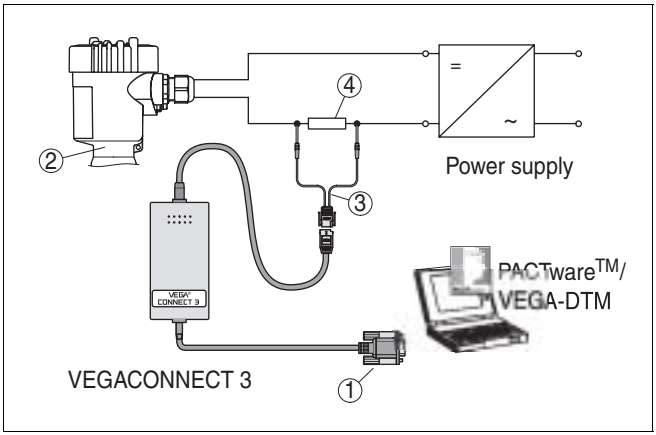


Fig. 19: Connecting the PC to the signal cable
1 RS232 connection
2 VEGABAR 52
3 HART adapter cable for VEGACONNECT 3
4 HART resistance 250 Ohm

Necessary components:

- VEGABAR 52
- PC with PACTware™ and suitable VEGA-DTM
- VEGACONNECT 3 with HART adapter cable (art. no. 2.25397)
- HART resistance approx. 250 Ohm
- Power supply unit

Note:
With power supply units with integrated HART resistor (inner resistor approx. 250 Ohm) there is no additional external resistor necessary. This applies e.g. for VEGA instruments VEGATRENN 149A, VEGADIS 371, VEGAMET 381. Also standard Ex separators are normally equipped with a sufficient current limitation resistor. In these cases, VEGACONNECT 3 can connected in parallel to the 4 … 20 mA cable.

7.2 Parameter adjustment with PACTware™

Further setup steps are described in the operating instructions manual "*DTM Collection/PACTware™*" attached to each CD and which can also be downloaded from our homepage. A detailed description is available in the online help of PACTware™ and the VEGA-DTMs.

Note:
Keep in mind that for setup of VEGABAR 52, DTM-Collection 11/2002 or a newer version must be used.

All currently available VEGA-DTMs are provided in the DTM Collection on CD and can be obtained from the responsible VEGA agency for a token fee. This CD includes also the up-to-date PACTware™ version. The basic version of this DTM Collection incl. PACTware™ is also available as a free-of-charge download from the Internet.

Move via www.vega.com and "*Downloads*" to the item "*Software*".

7.3 Parameter adjustment with AMS™ and PDM

For VEGA sensors, instrument descriptions for the adjustment programs AMS™ and PDM are available as DD or EDD. The instrument descriptions are already implemented in the current versions of AMS™ and PDM. For older versions of AMS™ and PDM, a free-of-charge download is available via Internet.

Move via www.vega.com and "*Downloads*" to the item "*Software*".

7.4 Saving the parameter adjustment data

It is recommended to document or save the parameter adjustment data. They are hence available for multiple use or service purposes.

The VEGA DTM Collection and PACTware™ in the licensed, professional version offer the suitable tools for a systematic project documentation and recording.

8 Maintenance and fault rectification

8.1 Maintenance

When used as directed in normal operation, VEGABAR 52 is completely maintenance-free.

8.2 Fault rectification

Causes of malfunction

VEGABAR 52 offers maximum reliability. Nevertheless faults can occur during operation. These may be caused by the following, e.g.:

- Sensor
- Process
- Power supply
- Signal processing.

Fault rectification

The first measures to be taken are to check the output signal as well as evaluate failure messages via the indicating and adjustment module PLICSCOM. The procedure is described in the following. Further comprehensive diagnostics options can be accessed via a laptop with the software PACTware™ and the suitable DTM. In many cases, the causes can be determined in this way and faults can be rectified.

24 hour service hotline

Should these measures not be successful, please call in urgent cases the VEGA service hotline under the phone number **+49 1805 858550**.

The hotline is available to you 7 days a week round-the-clock. Since we offer this service world-wide, the support is only available in the English language. The service is free of charge, only the standard telephone costs will be charged.

Checking the 4 … 20 mA signal

Connect a hand-held multimeter with a suitable measuring range acc. to the wiring plan.

? 4 … 20 mA signal not stable

- level fluctuations

→ set integration time via PLICSCOM or PACTware™

- no atmospheric pressure compensation

→ check the pressure compensation in the housing and clean the filter element, if necessary

? 4 … 20 mA signal missing

- incorrect connection to power supply

→ Check connection acc. to chapter "*Connection procedure*" and correct, if necessary, acc. to chapter "*Wiring plans*"

- no power supply

→ check cables for line break, repair, if necessary

- supply voltage too low or load resistance too high

→ check and adapt, if necessary

? Current signal greater than 22 mA or less than 3.6 mA

- electronics module or measuring cell defective

→ Exchange instrument or return it for repair

- Upcoming failure message via PLICSCOM

→ see below

In Ex applications, the regulations for the wiring of intrinsically safe circuits must be observed.

Error messages via PLICSCOM

? E013

- no measured value available[7)]

→ return instrument for repair

? E017

- adjustment span too small

→ repeat with modified values

? E036

- no operable sensor software

→ carry out a software update or return instrument for repair

7) Fault message can come up if the pressure is higher than the nominal range

? E041

- Hardware error

→ Exchange instrument or return it for repair

8.3 Exchanging the electronics

The electronics of VEGABAR 52 consists of the measuring cell electronics and the processing electronics. The measuring cell electronics in the process fitting is not accessible to the user. The processing electronics is in the form of a module in the housing. If this electronics is defective, it can be exchanged by the user.

The electronics modules differ only in their signal output and are suitable for all VEGABAR series 50 and 60 sensors. The following types are available:

- BR-E.60**H** (4 … 20 mA/HART)
- BR-E.60**P** (Profibus PA)
- BR-E.60**F** (Foundation Fieldbus)

An exchange of the same type is thus possible. If there is no electronics module available on site, it can be ordered from the responsible VEGA agency. It can be ordered **with** or **without** serial number.

The electronics **with** serial number includes **order-specific** data such as factory setting, seal material etc. The electronics **without** serial number includes **no order-specific** data. The serial number can be found on the type label of VEGABAR 52 or on the delivery note.

In both cases, the function of VEGABAR 52 is ensured.

8.4 Instrument repair

If it is necessary to repair VEGABAR 52 please proceed as follows:

You can download a return form (23 KB) from our homepage www.vega.com under: "*Services – Downloads – Forms and Certificates – Repair form*".

By doing this you help us carry out the repair quickly and without having to call back for needed information.

- Print and fill out one form per instrument
- Clean the instrument and pack it damage-proof

- Attach the completed form and possibly also a safety data sheet to the instrument.
- Send the instrument to the respective address of your agency. In Germany to the VEGA headquarters in Schiltach.

9 Dismounting

9.1 Dismounting procedure

Warning:
Before dismounting, be aware of dangerous process conditions such as e.g. pressure in the vessel, high temperatures, corrosive or toxic products etc.

Take note of chapters "*Mounting*" and "*Connecting to power supply*" and carry out the listed steps in reverse order.

9.2 Disposal

VEGABAR 52 consists of materials which can be recycled by specialised recycling companies. We have purposely designed the electronic modules to be easily separable. Mark the instrument as scrap and dispose of it according to national government regulations (e.g. in Germany acc. to electronic scrap ordinance).

Materials: see "*Technical data*"

If you cannot dispose of the instrument properly, please contact us about disposal methods or return.

10 Functional safety acc. to IEC 61508-4 (SIL)

10.1 General

Validity

This safety manual applies to measuring systems consisting of VEGABAR series 50 and series 60 pressure transmitter in two-wire version – 4 … 20 mA/HART:

VEGABAR 52, 54

VEGABAR 61 (up to 60 bar), 64, 65, 66, 67

Valid hardware and software versions:

- Serial number of the electronics >14138614
- Sensor software from Rev 3.22

Area of application

The measuring system can be used for process pressure or level measurement of gases, vapours and liquids which meet the specific requirements of the safety technology, e.g.:

In a single channel architecture (1oo1D) this is possible up to SIL2 and in a double channel, diverse redundant architecture up to SIL3.

Abbreviations, terms

Further abbreviations and terms are stated in IEC 61508-4.

SIL	Safety Integrity Level
HFT	Hardware Fault Tolerance
SFF	Safe Failure Fraction
PFD_{avg}	average Probability of dangerous Failure on Demand
PFH	Probability of a dangerous Failure per Hour
FMEDA	Failure Mode, Effects and Diagnostics Analysis
λ_{sd}	Rate for safe detected failure
λ_{su}	Rate for safe undetected failure
λ_{dd}	Rate for dangerous detected failure
λ_{du}	Rate for dangerous undetected failure
DC_S	Diagnostic Coverage; $DC_S = \lambda_{sd}/(\lambda_{sd}+\lambda_{su})$
DC_D	Diagnostic Coverage; $DC_D = \lambda_{dd}/(\lambda_{dd}+\lambda_{du})$
FIT	Failure In Time (1 FIT = 1 failure/10^9 h)
MTBF	Mean Time Between Failure
MTTF	Mean Time To Failure
MTTR	Mean Time To Repair

27507-EN-051004

Relevant standards

- IEC 61508 (also available as DIN EN)
  - Functional safety of electrical/electronic/programmable electronic safety-related systems
- IEC 61511-1
  - Functional safety – safety instrumented systems for the process industry sector – Part 1: Framework, definitions, system, hardware and software requirements

Safety requirements

The failure limit values for a safety function, depending on the SIL class (of IEC 61508-1, 7.6.2)

Safety integrity level	Low demand mode	High demand mode
SIL	**PFD_{avg}**	**PFH**
4	$\geq 10^{-5}$ up to $< 10^{-4}$	$\geq 10^{-9}$ up to $< 10^{-8}$
3	$\geq 10^{-4}$ up to $< 10^{-3}$	$\geq 10^{-8}$ up to $< 10^{-7}$
2	**$\geq 10^{-3}$ up to $< 10^{-2}$**	**$\geq 10^{-7}$ up to $< 10^{-6}$**
1	$\geq 10^{-2}$ up to $< 10^{-1}$	$\geq 10^{-6}$ up to $< 10^{-5}$

Safety integrity of the hardware for safety-relating subsystems of type B (IEC 61508-2, 7.4.3)

Safe failure fraction	Hardware fault tolerance		
SFF	**HFT = 0**	**HFT = 1 (0)**	**HFT = 2**
<60 %	not permitted	SIL1	SIL2
60 % up to <90 %	SIL1	**SIL2**	SIL3
90 % up to <99 %	SIL2	SIL3	(SIL4)
≥99 %	SIL3	(SIL4)	(SIL4)

Proven in use

Acc. to IEC 61511-1, paragraph 11.4.4 the failure tolerance HFT can be reduced by one for part systems proven in use if the following conditions are met:

- The instrument is proven in use
- Only process-relevant parameters can be modified on the instrument (e.g. measuring range, current output in case of failure ...)
- The modification of these process-relevant parameters is protected (e.g. password, ...)
- The safety function requires less than SIL4

10.2 Planning

Safety function

The measuring system generates on the current output a signal between 3.8 mA and 20.5 mA proportional to the process pressure or level.

This analogue signal is transmitted to a connected processing unit for monitoring the following conditions:

- Exceeding or falling below a set pressure value

The safety function is that a signal is outputted if the set switching point is reached on the processing unit.

Safe condition

The safe condition depends on the mode and is stated in the following chart:

	Monitoring upper pressure value	Monitoring lower pressure value
Safe condition	Exceeding of the switching point	Falling below the switching point
Output current in safe condition	> switching point (+1 %)	< switching point (+1 %)
Failure current "fail low"	<3.6 mA	<3.6 mA
Failure current "fail high"	>21.5 mA	>21.5 mA

The current tolerance ±1 % refers to the full measuring range of 16 mA.

Fault description

A fail-safe failure (safe failure) exists if the measuring system changes to the defined safe condition or to the failure mode without demand of the process.

If the internal diagnosis system detects an failure, the measuring system goes to failure mode.

A dangerous undetected failure exists if the measuring system does neither go to the defined safe condition when required by the process nor to the failure mode.

Configuration of the processing unit

If the measuring system delivers output currents of "fail low" or "fail high", this can be due to a failure.

The processing unit must therefore interpret such currents as failure and output a suitable fault signal.

If this is not the case, the appropriate shares of the failure rates must be assigned to the dangerous failures. Therefore the stated values in chapter "Safety-relevant characteristics" can deteriorate.

Low demand mode

If the demand rate is only once a year, then the measuring system can be used as safety-relevant subsystem in "low demand mode" (IEC 61508-4, 3.5.12).

If the ratio of the internal diagnostics test rate of the measuring system to the demand rate exceeds the value 100, the measuring system can be treated in the way it is executing a safety function in the mode with low demand rate (IEC 61508-2, 7.4.3.2.5).

Corresponding characteristics is the value PFD_{avg} (average Probability of dangerous Failure on Demand). It is dependent on the test interval T_{Proof} between the function tests of the protective function.

Numbers see paragraph "Safety-technical characteristics".

High demand mode

If the "low demand mode" does not apply, the measuring system must be used as safety-relevant subsystem in "high demand" (IEC 61508-4, 3.5.12).

The fault tolerance time of the complete system must be higher than the sum of the reaction times or the diagnostics test periods of all components in the safety chain.

Corresponding characteristics is the value PFH (failure rate).

Numbers see paragraph "Safety-technical characteristics".

Assumptions

The following assumptions form the basis for the implementation of FMEDA:

- Failure rates are constant, wear of the mechanical parts is not taken into account
- Failure rates of external power supplies are not included
- Multiple errors are not taken into account
- The average ambient temperature during the operating time is +40°C (104°F)
- The environmental conditions correspond to an average industrial environment
- The lifetime of the components is around 8 to 12 years (IEC 61508-2, 7.4.7.4, remark 3)
- The processing unit can interpret "fail low" and "fail high" failures as interferences and output a suitable fault signal

- The repair time (exchange of the meas. system) after a fail-safe error is eight hours (MTTR = 8 h)
- The scanning interval of a connected control and processing unit is max. 1 hour to react on dangerous, detectable errors
- The communication via the HART interface is not used for transmission of safety-relevant information

General instructions and restrictions

The measuring system should be applied acc. to the application by taking pressure, temperature, density and chemical properties of the medium into account.

The application-specific limits must be maintained and the specifications must not be exceeded.

10.3 Adjustment instructions and parameter adjustment

Instrument parameters

Since the plant conditions influence the safety of the measuring system, the instrument parameters must be set according to the application.

VEGABAR 52 suitable for the VEGA-DTM in conjunction with an adjustment software acc. to FDT/DTM standard, e.g. PACTware™ is permitted as auxiliary means.

Create a measurement loop

Via the adjustment software, the parameter *"Sensor acc. to SIL"* must be selected in the menu item *"Measurement loop"*.

Reaction in case of failure

The parameter adjustment of the interference current influences the safety-technical characteristics. For safety-relevant applications only the following inference currents are allowed:

- fail low = <3.6 mA
- fail high = 22 mA

Note:
The setting "Hold value" must not be selected.

Damping of the output signal

The damping of the output signal must be adapted to the process safety time.

Inadmissible modes

The measured value transmission by means of HART signal as well as HART multidrop mode are not permitted.

Inspection possibilities

The effectivity of the set parameters must be checked in a suitable way.

- After connecting the instrument, the output signal jumps to the set interference current (at the end of the switch on phase)
- In mode "Simulation", the signal current can be simulated independent of the current pressure or level

Access locking

To avoid unwanted or unauthorized modification, the set parameters must be protected against unintentional access:

- Activate the password protection on the adjustment program PACTware™
- Activate the PIN on the adjustment module PLICSCOM

The access by means of HART handheld or similar is not permitted.

The protection against unintentional or unauthorized adjustment can be prevent by e.g. sealing the housing cover.

Caution:
After a reset of the values, all parameters must be checked or readjusted.

10.4 Set up

Take note of the mounting and installation instructions of the operating instructions manual.

Within the setup, we recommend checking the safety function by means of an initial filling.

10.5 Reaction during operation and in case of failure

The adjustment elements must not be modified during operation.

In case of modifications during operation, you have to take note of the safety functions.

Occurring fault signals are described in the appropriate operating instructions manual.

In case of detected failures or fault signals, the entire measuring system must be switched out of service and the process held in a safe condition by means of other measures.

An electronics exchange is easily possible and described in the operating instructions manual.

If due to the detected failure, the electronics or the complete sensor is interchanged, the manufacturer must be informed (incl. a fault description).

10.6 Recurring function test

The recurring function test serves to reveal potential dangerous errors that are otherwise not discernible. The function of the measuring system must be checked at adequate intervals.

The operator is responsible for choosing the type of test and the intervals in the stated time frame. The time frame depends on the PFD_{avg} value acc. to the chart and diagram in section "Safety-related characteristics".

In high demand rate, no recurring function test is arranged in IEC 61508. A proof of the functional efficiency is seen in the more frequent demand of the measuring system. In double channel architectures it is useful to proof the redundancy by recurring function tests in appropriate intervals.

The test must be carried out in a way that verifies the flawless operation of the safety functions in conjunction with all system components.

This is ensured by a controlled reaching of the response height during filling. If filling up to the response height is not possible, then a response of the measuring system must be triggered by a suitable simulation of the level or the physical effect.

The methods and procedures used during the tests must be stated and their suitability must be specified. The tests must be documented.

If the function test proves negative, the entire measuring system must be switched out of service and the process held in a safe condition by means of other measures.

In the double channel architecture 1oo2D this applies separately to both channels.

10.7 Safety-related characteristics

Failure rates

The failure rates of the electronics, the mechanical parts of the pressure transmitter as well as the process fitting were determined by an FMEDA acc. to IEC 61508. Basis for the calculations are component failure rates acc. to SN 29500. All

values relate to an average ambient temperature during operation of +40°C (104°F). The calculations are further based on the instructions stated in chapter "*Planning*".

Overfill protection/monitoring upper pressure value

Interference current	"fail high"	"fail low"
λ_{sd}	378 FIT	20 FIT
λ_{su}	233 FIT	233 FIT
λ_{dd}	147 FIT	505 FIT
λ_{du}	183 FIT	183 FIT
DC_S	62 %	8 %
DC_D	45 %	73 %

Dry run protection/monitoring lower pressure value

Interference current	"fail high"	"fail low"
λ_{sd}	149 FIT	495 FIT
λ_{su}	233 FIT	233 FIT
λ_{dd}	366 FIT	20 FIT
λ_{du}	194 FIT	194 FIT
DC_S	39 %	68 %
DC_D	65 %	9 %

Fault reaction time

Error E013 (no measured value)	<2 sec
Error E041 (hardware error)	<20 sec
Error E036 (software error)	<1 h

General data

MTBF = MTTF + MTTR	$0.9x10^6$ h
max. useful life of the measuring system for the safety function	approx. 10 years

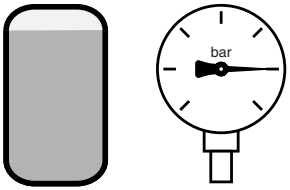
Proven in use

The judgment of the modification service was part to ensure "Proven in use".

Single channel architecture 1oo1D

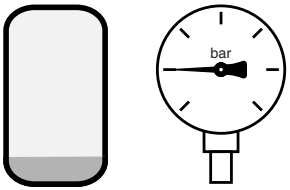
Specific characteristics

SIL	SIL2
HFT	0
Sensor type	Type B



Overfill protection/monitoring upper pressure value

SFF	81 %
PFD_{avg} T_{Proof} = 1 year T_{Proof} = 5 years T_{Proof} = 10 years	 <0.080x10^{-2}/h <0.399x10^{-2}/h <0.796x10^{-2}/h
PFH	<0.183x10^{-6}/h



Dry run protection/monitoring lower pressure value

SFF	79 %
PFD_{avg} T_{Proof} = 1 year T_{Proof} = 5 years T_{Proof} = 10 years	 <0.085x10^{-2}/h <0.423x10^{-2}/h <0.843x10^{-2}/h
PFH	<0.194x10^{-6}/h

Time-dependent process of PFD_{avg}

The time-dependent process of PFD_{avg} reacts in the time period up to 10 years virtually linear to the operating time. The above values only apply to the T_{Proof} interval, after which a recurring function test must be carried out.

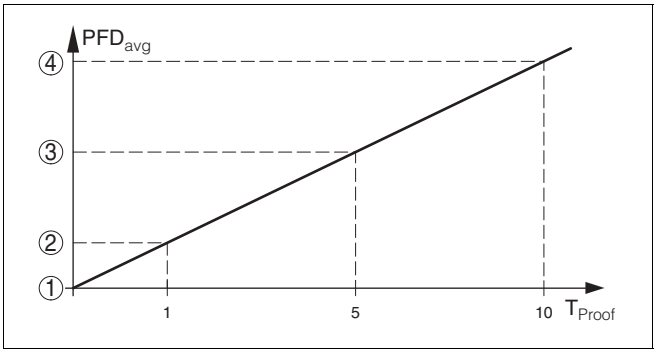


Fig. 20: Time-dependent process of PFD$_{avg}$[8)]
1 PFD$_{avg}$ = 0
2 PFD$_{avg}$ after 1 year
3 PFD$_{avg}$ after 5 years
4 PFD$_{avg}$ after 10 years

Double channel architecture

If the measuring instrument is used in double channel architecture, the safety-relevant characteristics of the selected structure of the measuring chain must be calculated acc. to the above failure rates (especially for the selected application). A Common Cause Factor must be taken into account.

8) Numbers see in the above charts.

11 Supplement

11.1 Technical data

General data

Manufacturer	VEGA Grieshaber KG, D-77761 Schiltach
Type name	VEGABAR 52
Parameter, pressure	Gauge pressure, absolute pressure, vacuum
Measuring principle	ceramic-capacitive, dry measuring cell
Communication interface	I^2C bus

Materials and weights

316L corresponds to 1.4404 or 1.4435

Materials, wetted parts	
– Prozessanschluss	316L , Hastelloy C276, PVDF
– Diaphragm	sapphire ceramic® (99.9 % oxide ceramic)
– Seal	FKM green (Viton), FKM black, Kalrez 6375, EPDM, silicone
Materials, non-wetted parts	
– Gehäuse	plastic PBT (Polyester), Alu-die casting powder-coated, 316L
– Seal ring between housing and housing cover	NBR (stainless steel housing), silicone (Alu/plastic housing)
– Inspection window in housing cover for PLICSCOM	Polycarbonate (UL746-C listed)
– Ground terminal	316Ti/316L (1.4571/1.4435)
Weight	0.8 kg (1.8 lbs)

Output variable

Output signal	4 … 20 mA/HART
Resolution	1.6 µA
Fault signal	current output unchanged; 20.5 mA; 22 mA; <3.6 mA (adjustable)
Current limitation	22 mA
Load	see load diagram in Power supply
Integration time (63 % of the input variable)	0 … 999 s, adjustable
Response time	150 ms (ti: 0 s, 0 … 100 %)
Fulfilled NAMUR recommendation	NE 43

Additional output variable – temperature

Processing is made via HART multidrop, Profibus PA and Foundation Fieldbus

Range	-50 … +150°C (-58 … +302°F)
Resolution	1°C (1.8°F)

Input variable

Adjustment range of the zero/span adjustment:

– zero	begin minus 50 % of the nominal range up to +95 % of the nominal range
– span	-120 … +120 % of the nominal measuring range[9)]
– Delta zero/span	max. 120 % of the nominal range

Adjustment range of the min. adjustment:

– percentage value	from -10 … 110 % of the nominal measuring range
– pressure value	from -50 … 150 % of the nominal measuring range

Adjustment range of the max. adjustment:

– percentage value	from -10 … 110 % of the nominal measuring range
– pressure value	from -50 … 150 % of the nominal measuring range

Recommended max. turn down 1:30 (no limitation)

Nominal range	Overload resistance	Vacuum resistance
Gauge pressure		
0…0.1 bar/0…10 kPa	15 bar/1500 kPa	-0.2 bar/-20 kPa
0…0.2 bar/0…20 kPa	20 bar/2000 kPa	-0.4 bar/-40 kPa
0…0.5 bar/0…50 kPa	30 bar/3000 kPa	-0.8 bar/-80 kPa
0…1.0 bar/0…100 kPa	30 bar/3000 kPa	-1.0 bar/-100 kPa
0…2.5 bar/0…250 kPa	50 bar/5000 kPa	-1.0 bar/-100 kPa
0…5 bar/0…500 kPa	65 bar/6500 kPa	-1.0 bar/-100 kPa
0…10 bar/0…1000 kPa	90 bar/9000 kPa	-1.0 bar/-100 kPa
0…25 bar/0…2500 kPa	130 bar/13000 kPa	-1.0 bar/-100 kPa
0…60 bar/0…6000 kPa	200 bar/20000 kPa	-1.0 bar/-100 kPa
-1.0…+0.0 bar/-100…0 kPa	35 bar/3500 kPa	-1.0 bar/-100 kPa
-1.0…+1.5 bar/-100…+150 kPa	50 bar/5000 kPa	-1.0 bar/-100 kPa

[9)] Values less than -1.0 bar cannot be adjusted.

Nominal range	Overload resistance	Vacuum resistance
-1.0…+5.0 bar/-100…+500 kPa	65 bar/6500 kPa	-1.0 bar/-100 kPa
-1.0…+10 bar/-100…+1000 kPa	90 bar/9000 kPa	-1.0 bar/-100 kPa
-1.0…+25 bar/-100…+2500 kPa	130 bar/13000 kPa	-1.0 bar/-100 kPa
-1.0…+60 bar/-100…+6000 kPa	200 bar/20000 kPa	-1.0 bar/-100 kPa
-0.05…+0.05 bar/-5…+5 kPa	15 bar/1500 kPa	-0.2 bar/-20 kPa
-0.1…+0.1 bar/-10…+10 kPa	20 bar/2000 kPa	-0.4 bar/-40 kPa
-0.2…+0.2 bar/-20…+20 kPa	30 bar/3000 kPa	-0.8 bar/-80 kPa
-0.5…+0.5 bar/-50…+50 Pa	35 bar/3500 kPa	-1.0 bar/-100 kPa
Absolute pressure		
0….1.0 bar/0…100 kPa	35 bar/3500 kPa	
0…2.5 bar/0…250 kPa	50 bar/5000 kPa	
0…5.0 bar/0…500 kPa	65 bar/6500 kPa	
0…10.0 bar/0…1000 kPa	90 bar/9000 kPa	
0…25.0 bar/0…2500 kPa	130 bar/13000 kPa	

Reference conditions and influencing variables (similar to DIN EN 60770-1)

Reference conditions acc. to DIN EN 61298-1

- Temperature: +18 … +30°C (+64.4 … +86°F)
- Relative humidity: 45 … 75 %
- Atmospheric pressure: 860 … 1060 mbar (86 … 106 kPa/ 12.5 … 15.4 psi)

Determination of characteristics: limit point adjustment acc. to DIN 16086
Characteristic: Linear
Calibration position: upright, diaphragm points downward
Influence of the installation position: <0.2 mbar/20 Pa (0.003 psi)

Deviation in characteristics[10)]

Deviation in characteristics

- Turn down 1:1: <0.075 %
- Turn down up to 1:5: <0.075 %
- Turn down up to 1:10: <0.1 %

10) Relating to the nominal range, incl. hysteresis and repeatability, determined acc. to the limit point method.

Influence of the product or ambient temperature

The following values are valid in the compensated temperature range 0 … +100°C (+212°F), reference temperature +20°C (+68°F):

Average temperature coefficient of the zero signal

– Turn down 1:1	< 0.05 %/10 K
– Turn down up to 1:5	< 0.1 %/10 K
– Turn down up to 1:10	<0.15 %/10 K

The following values are not within the compensated temperature range:

Average temperature coefficient of the zero signal

– Turn down 1:1	typ. < 0.05 %/10 K

Long-term stability (similar to DIN 16086, DINV 19259-1 and IEC 60770-1)

Long-term drift of the zero signal[11]	<0.1 %/2 years

Ambient conditions

Ambient, storage and transport temperature

– without PLICSCOM	-40 … +80°C (-40 … +176°F)
– with PLICSCOM	-20 … +70°C (-4 … +158°F)

Process conditions

The specifications of the pressure stage are used as an overview. The specifications on the type plate are applicable.

Pressure stage, process fitting

– Thread 316L, Hastelloy	PN 160
– Thread PVDF	PN 10
– Small flange DN 10 316L	PN 1.5

Product temperature depending on the measuring cell seal[12]

– Viton	-20 … +120°C (-4 … +248°F)
– Kalrez 6375	-10 … +120°C (14 … +248°F)
– EPDM	-40 … +120°C (-40 … +248°F)

Vibration resistance	mechanical vibrations with 4 g and 5 … 100 Hz[13]

[11] Acc. to IEC 60770-1, relating to the nominal range.
[12] With process fitting PVDF, max. +100°C (+212°F).
[13] Tested acc. to the regulations of German Lloyd, GL directive 2

Electromechanical data - version IP 66/IP 67

Cable entry/plug [14]	
– Single chamber housing	• 1x cable entry M20x1.5 (cable-ø 5 … 9 mm), 1x blind stopper M20x1.5 or: • 1x closing cap ½ NPT, 1x blind stopper ½ NPT or: • 1x plug depending on the version, 1x blind stopper M20x1.5
– Double chamber housing	• 1x cable entry M20x1.5 (cable-ø 5 … 9 mm), 1x blind stopper M20x1.5, plug M12x1 for VEGADIS 61 (option) or: • 1x closing cap ½ NPT, 1x blind stopper ½ NPT, plug M12x1 for VEGADIS 61 (option) or: • 1x plug (depending on the version), 1x blind stopper M20x1.5, plug M12x1 for VEGADIS 61 (option)
Spring-loaded terminals	for wire cross sections up to 2.5 mm^2

Electromechanical data – version IP 66/IP 68, 1 bar

Version IP 66/IP 68, 1 bar is only available for instruments with absolute pressure measuring ranges.

[14] Depending on the version M12x1, acc. to DIN 43650, Harting, Amphenol-Tuchel, 7/8" FF

Cable entry	
– Single chamber housing	• 1x IP 68 cable entry M20x1.5; 1x blind stopper M20x1.5 or: • 1x closing cap ½ NPT, 1x blind stopper ½ NPT
– Double chamber housing	• 1x IP 68 cable entry M20x1.5; 1x blind stopper M20x1.5; plug M12x1 for VEGADIS 61 (option) or: • 1x closing cap ½ NPT, 1x blind stopper ½ NPT, plug M12x1 for VEGADIS 61 (option)
Connection cable	
– Configuration	four cores, one suspension cable, one breather capillary, screen braiding, foil, mantle
– wire cross section	0.5 mm^2
– wire resistance	<0.036 Ohm/m
– tensile load	>1.200 N (270 pounds force)
– Standard length	5 m (16.4 ft)
– max. length	1000 m (3280 ft)
– Min. bending radius	25 mm (with 25°C/77°F)
– Diameter	approx. 8 mm
– Colour – standard PE	Black
– Colour – standard PUR	Blue
– Colour – Ex version	Blue

Indicating and adjustment module

Power supply and data transmission	through sensor via gold-plated sliding contacts (I^2C bus)
Indication	LC display in full dot matrix
Adjustment elements	4 keys
Protection	
– unassembled	IP 20
– mounted into the sensor without cover	IP 40
Materials	
– Housing	ABS
– Inspection window	Polyester foil

Supply voltage

Supply voltage	
– non-Ex instrument	12 … 36 V DC
– EEx ia instrument	12 … 30 V DC
– Exd instrument	18 … 36 V DC
Permissible residual ripple	
– <100 Hz	U_{ss}<1 V
– 100 Hz … 10 kHz	U_{ss} <10 mV
Load	see diagram

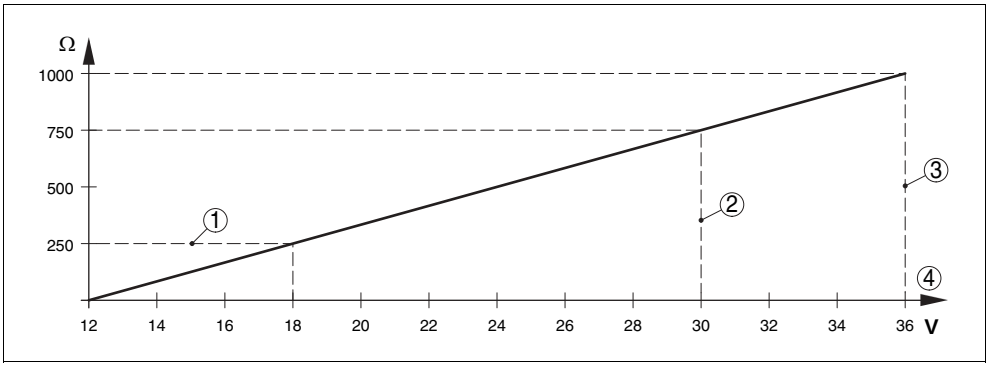


Fig. 21: Voltage diagram
1 HART load
2 Voltage limit EEx ia instrument
3 Voltage limit non-Ex/Exd instrument
4 Supply voltage

Electrical protective measures

Protection	
– All housings standard	IP 66/IP 67[15)]
– Alu and stainless housing, optionally available	IP 66/IP 68 (1 bar)
Overvoltage category	III
Protection class	II

[15)] Instruments with gauge measuring ranges can no longer detect the ambient pressure when being submerged, e.g. in water. This can falsify the measured value.

Available approvals or approvals applied for[16)17)]

ATEX ia	ATEX II 1G, 1/2G, 2G EEx ia IIC T6
ATEX ia a. d	ATEX II 1/2G, 2G EEx d ia IIC T6;
ATEX D	ATEX II 1/2D, 2D IP6X T
IEC	IEC Ex ia IIC T6
FM	FM Cl.I-III, Div 1 (IS)
Ship approvals	GL, LRS, ABS, CCS, RINA, DNV
Others	WHG

16) Deviating data with Ex applications: see separate safety instructions.
17) Depending on order specification.

11.2 Dimensions

Housing in protection IP 66/IP 67

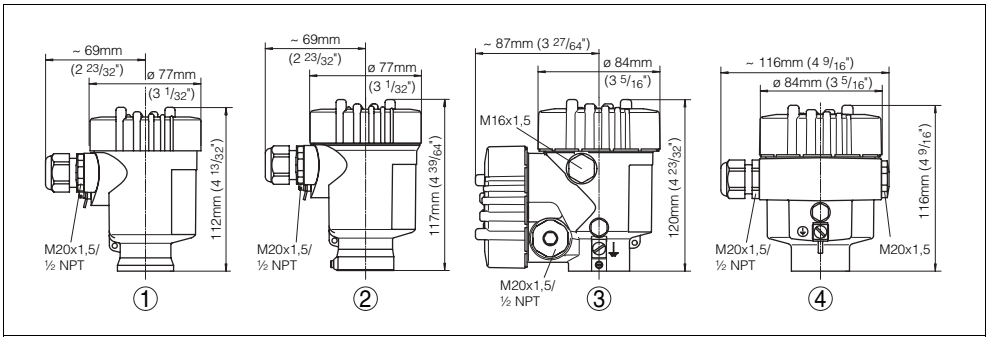


Fig. 22: Housing versions in protection IP 66/IP 67 (with integrated PLICSCOM the housing height increases by 9 mm/ 0.35 in)

1 Plastic housing
2 Stainless steel housing
3 Aluminium double chamber housing
4 Aluminium housing

Housing in protection IP 66/IP 68, 1 bar

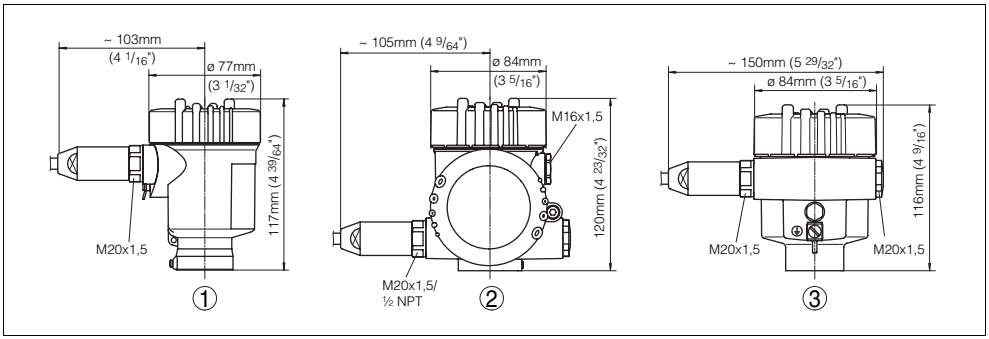


Fig. 23: Housing versions in protection IP 66/IP 68, 1 bar (with integrated PLICSCOM the housing height increases by 9 mm/0.35 in)

1 Stainless steel housing
2 Aluminium double chamber housing
3 Aluminium housing

VEGABAR 52

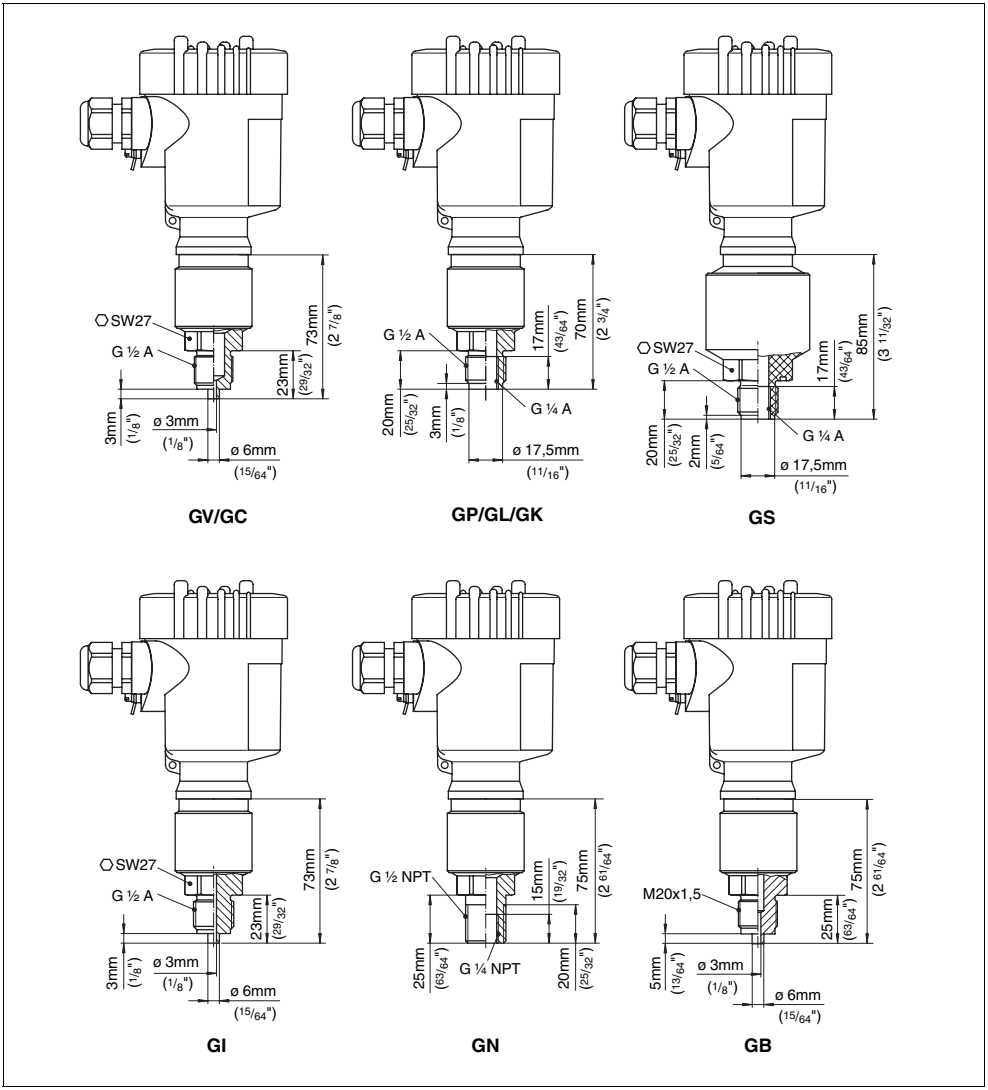


Fig. 24: VEGABAR 52 GV/GC = G 1/2A manometer connection EN 837 , GP/GL/GK = G 1/2A inner G 1/4A, GS = G 1/2A inner G 1/4A PVDF, GI = G 1/2A manometer connection volume-reduced, GN = 1/2 NPT, GB = M20x1.5 manometer connection EN 837

11.3 Certificate

CE declaration of conformity

CE

Konformitätserklärung

Declaration of conformity
Déclaration de conformité

VEGA

VEGA Grieshaber KG
Am Hohenstein 113
77761 Schiltach

erklärt in alleiniger Verantwortung, dass das Produkt / declares under our sole responsibility that our product / déclare sous sa seule responsabilité que le produit

VEGABAR 52, VEGABAR 53, VEGABAR 54
VEGABAR 61, VEGABAR 64, VEGABAR 65,
VEGABAR 66, VEGABAR 67
mit Netzteilprint NTP2-2LH und Digitalplatine BARP2-DH

auf das sich diese Erklärung bezieht, mit den folgenden Normen übereinstimmt / to which this declaration relates is in conformity with the following standards / auquel se réfère cette déclaration est conforme aux normes

DIN/EN 61326 : 2004 (Klasse B)
DIN/EN 61326 : 2004 einschließlich Anhang A
EN 61010 – 1 : 2001

gemäß den Bestimmungen der Richtlinien / following the provision of Directives / conformément aux dispositions des Directives

73/23 EWG
89/336 EWG

Schiltach, 24.09.2004

J. Fehrenbach

Josef Fehrenbach
Entwicklungsleitung

Fig. 25: CE declaration of conformity

Manufacturer declaration

Manufacturer declaration no. 24833

Messrs. VEGA Grieshaber KG
Am Hohenstein 113
77761 Schiltach

declares that the **Pressure transmitter type VEGABAR 52, 53, 54, 61, 64, 65, 66, 67 with electronics "H" 4 ... 20mA/HART**

in accordance with DIN/EN 60079-14/2004 paragraph 5.2.3 item c 1

and when used correctly under the condition that the operator follows the instructions in the documents listed:

- Mounting and operating instructions in the Operating Instructions manual
- Data and instructions of this manufacturer declaration
- Installation regulations

are suitable for use in Zone 2

The max. surface temperature increase* during operation is 59K.

With an ambient temperature of 70°C on the housing and a process temperature of 70°C, the max. surface temperature* is 129°C during operation.

Measures to maintain the explosion protection during operation:

- This declaration is only applicable if VEGABAR is operated within the stated electrical threshold values.
- Permissible operating voltage: Umin. = 14V; Umax. = 36V.
- The instrument must be installed and operated in such a way that ignition due to electrostatic charge is not expected (depending on the version, the process fitting or the housing are made of electrically non-conductive plastic).
- The availability, the perfect quality and the correct position of the seal between the lower part of the housing and the cover must be ensured; the cover must be screwed on tightly.
- If the instrument is operated with opened cover, the adjustment module PLICSCOM is mounted or its keys are pushed, it must be ensured that no explosive atmosphere is present.
- Make sure that the cable entry is tight and strain-relieved; the outer diameter of the connection cable must be adapted to the cable entry; the pressure screw of the cable entry must be tightened carefully.
- Free openings for cable and cable entries must be covered tightly.
- VEGABAR 66, 67 must be mounted in such a way that contact of the sensor to the vessel wall can be excluded by taking vessel installations and flow conditions in the vessel into account.
- The surface temperature must not exceed the ignition temperature of the concerned explosive atmosphere.

*Single component in the instrument

This instrument was judged by a person meeting the requirements acc. to DIN/EN 60079-14.

VEGA Grieshaber KG
Schiltach, den 19.05.05

i.V. Prufrad

Fig. 26: Manufacturer declaration

SIL declaration of conformity

Konformitätserklärung
declaration of conformity
Déclaration de conformité
IEC 61508 / IEC 61511

VEGA Grieshaber KG, Am Hohenstein 113, D-77761 Schiltach

erklärt als Hersteller, dass die Druckmessumformer
declares as manufacturer, that the pressure transmitters
déclare en tant que fabricant que les capteurs de pression

VEGABAR 52, 54 und
VEGABAR 61, 64, 65, 66, 67
(4 ... 20 mA HART®)

entsprechend der IEC 61511 für den Einsatz in sicherheitsinstrumentierten Systemen geeignet sind. Die Sicherheitstechnische Kennzahlen sowie die Sicherheitshinweise im Safety Manual sind zu beachten.
(siehe entsprechende Betriebsanleitung, Kapitel „Funktionale Sicherheit")

according to IEC 61511 are suitable for safety instrumented systems (SIS). The safety related characteristics as well as the instructions of the safety manual must be considered.
(see corresponding operating instruction, chapter "Functional Safety")

conviennent à une utilisation dans les systèmes de sécurité instrumentés suivant la norme IEC 61511. Les caractéristiques techniques relatives à la sécurité ainsi que les consignes de sécurité stipulées dans le Safety Manual sont à respecter.
(voir la notice technique de mise en service au chapitre „Sécurité fonctionnelle")

Schiltach, 15.03.2005
VEGA Grieshaber KG

i.V. Frühauf
Leiter Zertifizierung
Head of Certification department
Directeur du département de certification

i.A. Blessing
Beauftragter für Funktionale Sicherheit
Commissioner for functional safety
Délégué à la sécurité fonctionnelle

11.4 Industrial property rights

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Further information see **http://www.vega.com**.
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All statements concerning scope of delivery, application, practical use and operating conditions of the sensors and processing systems correspond to the information available at the time of printing.

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